DOCUMENT RESUME

ED 479 598 IR 022 202

AUTHOR	Ravenscroft, Andrew
TITLE	Communities, Communication and Cognitive Change: Social Processes and Designing Engaging E-Learning Discourse.
PUB DATE	2002-10-00
NOTE	7p.; In: E-Learn 2002 World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education. Proceedings (7th, Montreal, Quebec, Canada, October 15-19, 2002); see IR 022 093.
AVAILABLE FROM	Association for the Advancement of Computing in Education (AACE), P.O. Box 3728, Norfolk, VA 23514. Tel: 757-623-7588; e-mail: info@aace.org; Web site: http://www.aace.org/DL/.
PUB TYPE	Information Analyses (070) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS
DESCRIPTORS	Cognitive Processes; Communication (Thought Transfer); *Computer Mediated Communication; Distance Education; Educational Research; *Instructional Design; Man Machine Systems; Online Systems
IDENTIFIERS	*Learning Communities; Learning Through Discussion; Social Construction

ABSTRACT

A number of projects over the past decade, in a range of educational contexts, have sought to link forms and patterns of communicative interaction to improvements in knowledge, conceptual understanding and reasoning skills. These initiatives have produced dialog models, methodologies for developing these in ways that lead to the design of dialogical e-learning systems and empirical evaluations that have implicated the role of context in effective educational interaction. The nature and characteristics of online communities have emerged as critical factors in designing educational discourse that exploits developed models and implemented systems. This paper reviews a selection of work on dialogical approaches to learning, dialog design, system design and learning communities before discussing the possibility of an integrated model for e-learning discourse, which accepts that learning is, ostensibly, a social process. (Contains 30 references.) (Author)

Reproductions supplied by EDRS are the best that can be made
from the original document.

Communities, Communication and Cognitive Change: Social Processes and Designing Engaging e-learning Discourse

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

G.H. Marks

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2B

ANDREW RAVENSCROFT
Learning Technology Research Institute (LTRI)
London Metropolitan University
166-220 Holloway Road
London, UK, N7 8DB.
Tel: +44 (0)20 7314 4301
Fax: +44(0)20 7314 4302
Email: a.ravenscroft@unl.ac.uk

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Abstract: A number of projects over the past decade, in a range of educational contexts, have sought to link forms and patterns of communicative interaction to improvements in knowledge, conceptual understanding and reasoning skills. These initiatives have produced dialogue models, methodologies for developing these in ways that lead to the design of dialogical elearning systems and empirical evaluations that have implicated the role of context in effective educational interaction. We don't, for example, "argue and discuss with anyone, about anything, at any time". Hence, the nature and characteristics of online communities have emerged as critical factors in designing educational discourse that exploits developed models and implemented systems. This paper will review a selection of work on dialogical approaches to learning, dialogue design, system design and learning communities before discussing the possibility of an integrated model for e-learning discourse, which accepts that learning is, ostensibly, a social process.

Keywords: Human-Computer Interaction, Instructional Design for eLearning, Learning Communities.

ED 479 598

1 Vygotsky: linking dialogue processes to cognitive change

Vygotsky's (1978) theory of the development of higher mental processes can provide a foundation and inspiration for approaches to elearning that emphasise the necessity for collaborative, argumentative and reflective discourses. Although he conceived learning as an instructional process aimed at 'transforming the mind of the child into that of an adult', nowadays it is accepted that his ideas can equally apply to any relevant situation involving a learner and a more learned other[1]. This more learned other may be a teacher or a more capable student—which is often the case in higher education settings. Similarly, his theory is not bound to the 'traditional' concept of a school, but can be applied more generally, to online and other learning communities.

Vygotsky draws a clear distinction between lower level mental processes, such as elementary perception and attention, and higher level mental processes that include verbal thought, logical memory, selective attention and reasoning. He argues for a qualitative distinction between these two levels of mental performance, because unlike lower level activity, the higher level is: mediated through cultural symbols and tools; self-regulated rather than bound to a stimulus context; social in origin; and, the result of conscious awareness rather than an automatic response.

Critical in distinguishing higher and lower level activity is the qualitative developmental transition that occurs when language, or any other signification system, is internalised to operate as a mediating factor between environmental stimuli and an individual's response. This mediation *transforms* the lower level activity by *lifting it onto a higher plane* and can be achieved through the application of material or psychological tools. Further, in using such tools we become conscious and in control of our mental activities. However, Vygotsky considered language to be the most interesting and powerful of these semiotic mediators and the primary tool for thinking. He claims that these higher mental functions originate in the social, and development proceeds 'from action to

[1] For brevity, henceforth, we will use the word 'tutor' in this paper to refer to the person that is considered 'the more learned other', who may be a teacher or a more capable student.

IR022202

BEST COPY AVAILABLE

thought' and therefore communication and social contact are essential. It is through the communicative process that external signification systems conveying interpersonal communication become internalised to operate as intrapersonal psychological tools that *transform* mental functioning. In other words, internal language and thought are transformed from the 'outside'. This idea is critical to Vygotsky's notions about conceptual development and the evolution of linguistic meaning as we develop our higher level mental processes.

The primary theoretical construct introduced by Vygotsky for 'engineering' this conceptual change is the zone of proximal development (ZPD). According to Vygotsky (1978), the ZPD represents the place where the student's empirically rich but disorganised spontaneous, or contextual, concepts meet with the *systemacity* and logic of the tutor's reasoning. It is:

"...the distance between a child's actual developmental level as determined by independent problem solving and the higher level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers." (Vygotsky, 1978, p. 86)

Through tasks, exercises, discussions and dialogue within the ZPD, the weaknesses of the student's spontaneous concepts and reasoning are made explicit and compensated for by the strengths of the tutor's scientific conceptions and reasoning. Thus, in performing the task, the student 'appropriates' the more mature, scientific conceptualisations and becomes socialised into the expert practitioner's knowledge and approach to particular problems, subsequently operating as a more expert practitioner themselves.

The notion of the ZPD is also a positive and powerful paradigm for evaluating and improving the teaching-learning process in cooperative contexts. Failure to complete a task successfully can be evaluated in terms of what 'extra' should be introduced to improve the ZPD, instead of simply assessing a 'failure' in performance.

2 Activity theory: relations between the learner and their context

Activity theory is a development of Vygotsky's (1978) work that provides a framework for learning and development that accepts that meaning arises and evolves during interactions that are influenced by the social relations within a community of practice. Or, 'you are what you do' (Nardi, 1996, p.7) in a natural context that is influenced by history and culture. Hence, human practices are conceived as developmental processes 'with both individual and social levels interlinked at the same time.' (Knutti, 1996, p. 25).

An activity is considered the minimal meaningful context for individual actions, which means they are not rigid and static, but continuously changing and developing. These activities contain various artifacts, such as signs, methods, machines and computers, that serve as mediational tools to facilitate the operationalisation of conceptions in ways that lead to 'higher levels of thinking'. In achieving this, the mediational processes involving subjects and tools are directed towards objects, or objectives, and in transforming the objective into an outcome there is motivation for performing the activity. The addition of another 'level' that links the subject and the community and the objectives and the community is also included to complete the basic structure of an activity (Engestrom, 1987). Here, the relationship between subject and objective is mediated by tools, the relationship between subject and community is mediated by rules, and the relationship between objective and community is mediated by the division of labour. Therefore, this framework is essentially holistic. It emphasises relationships between interactions, processes and outcomes and the relevance of social conditions, such as a shared enterprise and the need for mutual engagement of conceptualisations. Therefore, the relevance of conceptual similarities and differences and changes and developments over time are taken into account in the design of mediated learning activities.

3 Discourse analysis and dialogue designs

Given that theories of learning have implicated dialogue as being central to shaping conceptual development, there is a need to further examine the features that make educational dialogue effective in ways that inform the development and use of systems that support e-learning. Work investigating natural educational dialogues that aim to change student conceptualisations in a variety of situations, have produced some consensus as to the roles, strategies and speech acts (sets of moves) which are likely to be important. For example, using the DISCOUNT Discourse Analysis scheme (Pilkington, 1999), which includes Exchange Structure, Move

(Speech-Act) and Rhetorical analyses, it is possible to determine which participants are active in dialogue and how. DISCOUNT has been used to give insights into collaboration in natural and CMC dialogue contexts (de Vincente, Bouwer & Pain, 1999; Pilkington, Treasure-Jones & Kneser, 1999). From these and similar studies there is evidence that 'successful' exchanges are more likely to include clarifying, challenging, hinting and justification moves.

A more direct approach to linking discourse analysis to system design has been proposed by Ravenscroft & Pilkington (2000), who developed the methodology of *investigation by design* (hereafter IBD). This combines discourse analysis and dialogue game techniques (e.g. MacKenzie, 1979; Walton, 1984; Ravenscroft, 2000) to specify formal dialogue models that can me implemented as intelligent and collaborative e-learning systems. A central tenet of this approach is to take some of the features of successful dialogue—as yet not fully proven to be effective—and actively design them into interaction scenarios aimed at supporting learning. Once these models have been developed, we can evaluate their effectiveness, and systematically vary the roles, strategies, tactics and moves adopted to further explore the utility of these features in guiding learners towards more systematic reasoning. Within this IBD scheme, we use the DISCOUNT (Pilkington, 1999) scheme to develop dialogue models specified as dialogue games. A major advantage of the dialogue game approach is that it allows us to incorporate rules and constraints into the design of communicative interactions that are consequently structured and managed along the lines we prescribe. Therefore, these systems can act as powerful cognitive and mediational tools that guide the dialogue and lines of reasoning in ways that lead to improvements in individual or shared knowledge and understanding.

Research investigating and examining the suitability of this approach, that has been ongoing for the past ten years (see Ravenscroft, 2001; for a review), has shown that dialogue game theory can be used as a software design paradigm for types of computer-mediated and computer-based argumentation dialogue in educational contexts. Here, the notion of a game is used to characterise and specify discourse in terms of the goals of the interlocutors (e.g. the elaboration of knowledge, the co-elaboration of knowledge, supporting or winning an argument), the relative roles of participants (e.g. inquirer, critiquer, explainer) and the types of dialogue tactics and moves that are performed (e.g. Assertion, Challenge, Withdraw). Also, rules govern the types of moves available to participants, the effect these have on commitment—to beliefs—and issues of initiative and turn-taking. Note that, in focusing on pragmatic level knowledge, these projects have not needed to directly address issues of semantic and syntactic level natural language processing and generation that have been examined by Pilkington (1992) and Pilkington & Grierson (1996). Other research has demonstrated how dialogue game theory can represent a range of dialectical discourse genres (Maudet & Evrard, 1998; Moore & Hobbs, 1996), include multimedia features (Moore, 2000) and be adapted to take account of multiuser polylogues (Maudet & Moore, 2000).

4 System designs: cognitive tools and intelligent dialogue

Projects adopting the approach above have produced a number of successful designs. They have shown that a model of collaborative argumentation—a *facilitating* dialogue game—supports and stimulates conceptual change and development in science (Ravenscroft, 2000; Ravenscroft & Matheson, 2002). And a model of fair and reasonable debate—a DC dialogue game—can be used to teach generic reasoning skills for debating controversial subjects (Pilkington, *et al*, 1992; Moore, 1993). The former dialogue game has been implemented in the 'intelligent' computer-based dialogue system called CoLLeGE and the latter model has been implemented in the DIALAB computer-mediated argumentation system, that structures fair and reasonable debate. Another project called CLARISSA has used dialogue games to implement a computer modelling 'laboratory' for investigating collaboration (Burton, Brna & Pilkington, 2000).

However, in evaluating and testing some of these dialogue games (Ravenscroft & Matheson, 2002; McAlister, 2001), the relevance of the broader, socio-cultural context is becoming increasingly apparent. So, to integrate these dialogue game approaches within e-learning contexts where they will function optimally, we will first need to understand and consider the appropriate 'conditions' for these discourses, as we cannot hold a serious and engaging educational dialogue 'with anyone, about anything, at any time'. One current project is integrating a dialogue game for critical discussion, realised through a structured interface—of sentence openers and preferred moves, within a broader framework for educational conferencing and moderating (Salmon, 2000). Thus linking a cognitive tool with a framework that defines the socio-cultural context in which it should be

effective. However, preliminary findings from this project are further emphasising the need to better conceptualise and design for the community and contexts in which educational discourses operate. In brief, we need to investigate, examine and, where possible – design, appropriate learning communities if we want to support effective e-learning discourse.

5 Learning communities and cooperative learning

According to Preece (2000) 'The internet has given rise to a new community model of communication' (p xii). Currently, however, there is little agreement on what this model actually is, how we can conceptualise it, or how it can be operationalised and exploited for educational purposes. Preece (2000) herself argues for Community-Centred Development (CCD), that accepts the sociology and social psychology of community development and maintenance, putting the 'community' firmly at the centre of the design process in the same way that Norman (1986) conceived the 'user' as central. Within this scheme she points out that we need to support the evolution of communities, design for usability and plan for sociability. This approach seems to fully accept that learning is, essentially, a social process, but raises a crucial question about whether we can actually build online communities that truly satisfy the necessary social conditions for effective, and often dialectical, discourse interactions. Or, putting this another way, can we be sufficiently social online to have meaningful conversations, discussions and arguments that lead to conceptual change and development?

The recent work of Wenger (1998) on 'Communities of Practice' considers meaning, along with learning and identity, as important features in the educative process. This theory of learning, that is particularly aimed at the work-place, holds that:

'...engagement in social practice is the fundamental process by which we learn and so become who we are. The primary unit of analysis is neither the individual or social institutions but rather the informal "communities of practice" that people form as they pursue shared enterprises over time.'

Central to this notion, inspired by Lave and Wenger's (1991) work on 'situated cognition', is that these communities have knowledge about practice embedded within them, and therefore learning occurs through legitimate entry and participation within the community. Or, 'Learning is a process that takes place within a participation framework, not an individual mind' (Lave & Wenger, 1991, p 15). Wenger (1998) argues that effective communities of practice are characterised by mutual engagement, joint enterprise, shared repertoire and the negotiation of meaning in practice. Whilst this theory has been readily adopted by the business community, successful realisations in e-learning have been limited, with a few exceptions (e.g. McConnell, 2000). There can be difficulties in operationalising these key concepts within the design and operation of online communities and communication. For example, there is a problem mapping some of the features to desired discourse practices. Whilst we obviously want to promote features such mutual engagement, shared repertoire and negotiation of meaning, other aspects such as joint accountability, diversity and partiality are not necessarily appropriate in most educational contexts—except, perhaps, informal learning (for the latter two). In brief, it is not yet clear how to design, develop and maintain a community of practice supporting engaging e-learning discourse. Nevertheless, Wenger's work has provided a valuable 'conceptual resource' of socio-cultural features that should be considered when developing and designing communications in context.

McConnells (2000) work focussing on "Implementing Computer Supported Coopreative Learning" (hereafter CSCL) is one of the few practical approaches that considers Wenger's work, as he emphasises the role for socially oriented theories of learning (e.g. Vygotsky, 1978; Lave & Wenger, 1991). He proposes six design features for promoting and supporting cooperative learning: openness in the educational process (the learning community); self-determination in learning; having a real purpose in the cooperative process; a supportive learning environment; collaborative assessment of learning; and assessment and evaluation of the ongoing learning process. And he presents a specific design for a CSCL system that is successfully implemented in a UK higher education setting. The emphasis here is quite 'high level', being placed on learning management and organisation that supports CSCL, or the conditions and issues for cooperative learning in general. Whereas 'lower level' questions, such as whether the discourse processes that are fostered lead to genuine improvements in knowledge and understanding remain largely unanswered in any systematic way. Nevertheless, this work makes a useful start in considering social processes in the design and management of computer-mediated activities, and McConnell himself freely admits to the state of research and development in this field:

"CSCL is an idea that helps surface questions about the role of technology in learning, and about the nature and purpose of learning itself" (McConnell, 2000; p 2).

6 A synthesis: towards an integrated model for designing e-learning discourse

This paper has argued that effective e-learning requires high quality educational discourse, that leads to, at the least - improved knowledge, and at the best – conceptual development and improved understanding. We hold that this is possible if we adopt a sophisticated approach to elearning design that accounts for necessary relationships between cognitive changes, dialogue processes and the communities, or contexts, for learning. Or, putting this another way, we need a socio-cultural framework for cognitive change, that includes motivational and affective factors. Thus far, work on developing dialogue models and system designs linked to cognitive change and development has been somewhat limited but successful, and necessitated at least ten years of research and development. But, at least, we now have a reasonable idea about what counts as patterns of good educational discourse, and how we can design systems that can effectively mediate the desired dialogue processes, in ways that, hopefully, lead to the internalisation of improved reasoning and dialectic processes. However, the key questions at the moment include: how can we design or develop the social conditions and communities that give rise to the dialogue models and discourse practices that are desired in e-learning contexts? What are the most optimal group characteristics, in terms of size and profile for example? Can we establish 'preconditions', in terms of learner characteristics and settings that will favour high quality educational dialogue?

So, the next step must be to investigate and examine e-learning communities to develop a better conceptualisation of how and why they operate successfully, paying particular attention to motivational and affective issues and factors. This should then provide the basis to either harmonise the operation of our dialogue models within existing community practice or, more prescriptively, to develop communities that are aimed at supporting high quality collaborative and dialectical e-learning discourse. Hence, we are currently developing methodologies for investigating learning communities in a number of projects that include traditional and informal e-learning contexts.

To conclude, we need to cultivate effective e-learning communities, emphasising shared interest and enterprise, and other motivational aspects. Within these communities, we can then stimulate, structure and manage high quality educational discourse that fosters collaboration, critical discussion and argumentation. We will then be able to investigate the link between these communicative practices and improvements in knowledge and understanding, because we will have to truly support the mutual engagement of conceptualisations to realise the co-elaboration of knowledge and understanding that corresponds to effective learning. Currently, we are making reasonable progress, given that work on how to develop, maintain and manage online communities is itself both new and complex. But we cannot avoid the challenge to make elearning engaging and ostensibly social, because very few citizens want to or can learn alone.

References

BURTON, M., BRNA, P. & PILKINGTON, R. (2000) Clarissa: a laboratory for the modelling of collaboration, *International Journal of Artificial Intelligence in Education*, 11, pp. 79-105.

DE VINCENTE, A., BOUWER, A., & PAIN, H (1999) Initial impressions on using the DISCOUNT scheme, in: R. PILKINGTON, J. MCKENDREE, H. PAIN, & P. BRNA (Eds) *Proceedings of the Workshop on Analysing Educational Dialogue Interaction. Workshop at 9th International Conference on Artificial Intelligence in Education, 18th-19th July, 1999.* (87-94). Le Mans, France: University of Le Mans.

ENGSTROM, Y. (1987) *Learning by Expanding: an activity theory approach to developmental research* (Helsinki, Orienta-konsultit).

KNUTTI, K. (1996) Activity theory as a potential framework for human-computer interaction research, in: NARDI, B (Ed). *Context and Consciousness: activity theory and human-computer interaction* (Cambridge, MIT Press).

LAVE, J & WENGER, E. (1991) Situated Learning: Legitimate Peripheral participation, Cambridge University Press.

MACKENZIE, J. D. (1979) Question-begging in non-cummulative systems, *Journal of Philosophical Logic*, 8, pp. 117-133.

MAUDET, N., & EVRARD, F. (1998) A generic framework for dialogue game implementation, in: HULSTIJN, J. & NIJHOLT, A. (Eds) *Second Workshop on Formal Semantic and Pragmatics of Dialogue* (TWLT13) May 13-15, 1998, University of Twente,

MAUDET, N & MOORE, D. J. (2000) Dialogue games as dialogue models for interacting with, and via, computers, submitted to *Informal Logic*.
MCALISTER, S. (2001). Argumentation and Design for Learning, Dialogue & Design Research Group Technical Report DDRG-01-2, Institute of Educational Technology, Open University, UK.
MCCONNEL, D. (2000) *Implementing Computer Supported Cooperative Learning*, Kogan Page.
MOORE, D. J. (2000) A framework for using multimedia within argumentation systems, *Journal of Educational Multimedia and Hypermedia*, 9, pp.83-98.
MOORE, D. J & HOBBS, D. J. (1996) Computational use of philosophical dialogue theories, *Informal Logic*, 18, pp.131-163.
MOORE, D. J. (1993). *Dialogue Game Theory for Intelligent Tutoring Systems* Unpublished Ph.D. thesis. Computer Based Learning Unit, University of Leeds, UK.
NARDI, B. (1996) *Context and consciousness: activity theory and human-computer interaction* (Cambridge, MIT Press).
NORMAN, D. A. (1986). Cognitive Engineering. In Norman, D & Draper, S. (1986) (Eds.) User-Centred Systems Design. Hillsdale, NJ: Lawrence Erlbaum.
PILKINGTON, R, M. (1992) *Intelligent Help: Communicating with Knowledge Based Systems* (London, Paul Chapman).
PILKINGTON, R.M. (1999) *Analysing Educational Discourse: The DISCOUNT Scheme*. Version 3, January 1999. CBL Technical Report No. 99/2, ISBN: 1 901418 022.
PILKINGTON, R.M., HARTLEY, J.R., HINTZE, D. & MOORE, D. (1992) Learning to argue and arguing to learn: an interface for computer-based dialogue games, *International Journal of Artificial Intelligence in Education*, 3, pp. 275-85.
PILKINGTON, R. & GRIERSON, A. (1996) Generating explanations in a simulation-based learning environment, *International Journal of Human-Computer Studies*, 45, pp. 527-551.
PILKINGTON, R. M., TREASURE-JONES, T., & KNESER, C. (1999) Educational CHAT: using Exchange Structure Analysis to investigate communicative roles in CMC seminars, in: P. BRNA, M. BAKER, & K. STENNING (Eds) *Roles of Communicative Interaction in Learning to Model in Mathematics and Science: Proceedings of C-LEMMAS TMR Conference*. 15th-19th April, Ajaccio, Corsica (Computer Based Learning Unit, University of Leeds).
PREECE, J. (2000) *Online Communities: designing usability, supporting sociability*, John Wiley Ltd.
RAVENSCROFT, A. (2000). Designing Argumentation for Conceptual Development, *Computers & Education*, 34 (2000), pp. 241-255.
RAVENSCROFT, A. (2001) Designing e-learning interactions in 21C: Revisiting and re-thinking the role of theory, *European Journal of Education: Special edition on On-line Learning*, Vol. 36, No. 2, pp. 133-156.
RAVENSCROFT, A. & PILKINGTON, R.M. (2000) Investigation by design: developing dialogue models to support reasoning and conceptual change, *International Journal of Artificial Intelligence in Education*, 11, pp. 273 – 298.
RAVENSCROFT, A. & MATHESON, M.P. (2002). Developing and evaluating dialogue games for collaborative e-learning interaction, *Journal of Computer Assisted Learning: Special Issue: Context, collaboration, computers and learning*, Vol. 18, No. 1, pp. 93-102.
SALMON, G. (2000) *E-moderating: The Key to Teaching and Learning Online*, London: Kogan Page.
VYGOTSKY, L. (1962) *Thought and Language* (Cambridge, MA, Harvard University Press).
VYGOTSKY, L. (1978) *Mind in Society* (Cambridge, MA, Harvard University Press).
WALTON, D. (1984) *Logical Dialogue-Games and Fallacies* (published thesis) (Lanham, University Press America).
WENGER, E. (1998) *Communities of Practice*, Cambridge University Press.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

[X] This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

[ ] This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").